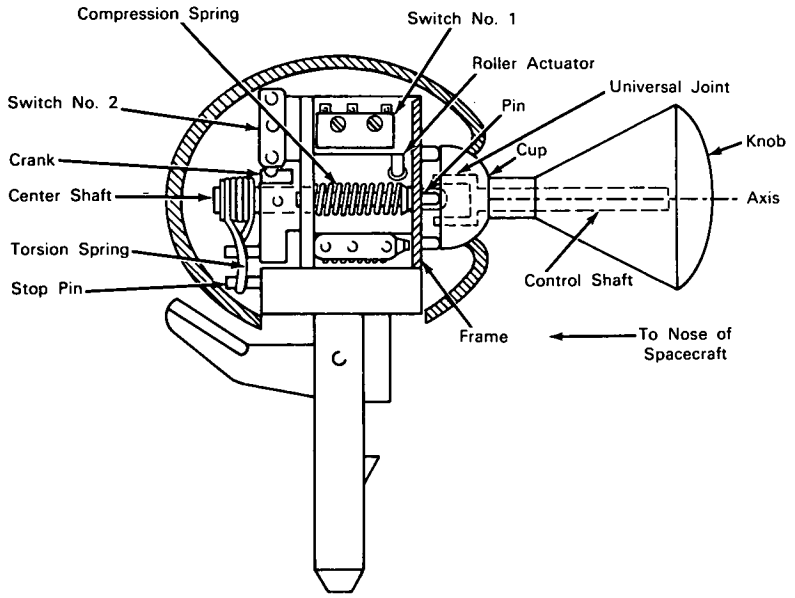
NASA TECH BRIEF

Knob Linkage Permits One-Hand Control of Several Operations



The problem: Selective actuation of any one of several electrical or mechanical functions using only one control handle. A one-hand device was particularly required for three-axis control of the motion (pitch, yaw, and roll) of a spacecraft.

The solution: An electromechanical device with a single knob which can be positioned by one hand to control the flight attitude of a spacecraft.

How it's done: The knob is attached to a control shaft which is connected to a universal joint. A cup is mounted on the same shaft. By means of four identical sets of internal components located at 90° intervals about the center shaft (only one set of components is shown in the illustration), the vehicle can be controlled to yaw left or right and pitch up or down. These components also provide positive centering action. Only one linkage is used for roll control of the vehicle. As an aid in orienting the operator, the knob is made to represent the shape of the vehicle and is positioned so that the axis of the control shaft is parallel to the vehicle's principal axis.

Operation of the device is best described by examples. If it is desired to cause the vehicle to yaw to the right, the knob (which pivots about the universal joint) is pushed to the left (knob rotates out of the plane of the paper) to apply a force to the edge of the cup and move the pin to the left against the elastic force of the compression spring. The roller actuator is thus free to drop and release switch No. 1 to turn on an electrical signal that initiates operation of the appropriate reaction motors which yaw the vehicle to the right. When the knob is released, the compression spring forces the pin to the right until the shoulder of the pin is stopped

(continued overleaf)

by the frame. At this point, the roller actuator has been forced up to the larger-diameter portion of the pin restoring the switch to its initial position and stopping the reaction motors. At the same time the knob is returned to its centered condition.

When it is desired to roll the spacecraft to the left, for example, the knob is turned counterclockwise. This action is transmitted through the control shaft, the universal joint, and the central shaft to the crank which rotates and causes switch No. 2 to turn on an electrical signal to the roll reaction motors. At the same time, the crank moves the end of the torsion spring away from the stop pin. When the knob is released, this spring rotates the crank back to its centered condition. At this point, the torsion spring is restored to its initial position against the stop pin and switch No. 2 is released.

Notes:

1. The principle of this design may have application to remote-control switching devices in situations where numerous operations would be most conveniently controlled by manipulation of a single knob.
2. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Manned Spacecraft Center
   P.O. Box 1537
   Houston, Texas, 77001
   Reference: B65-10022

Patent status: NASA encourages the immediate commercial use of this invention. Inquiries about obtaining rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546.

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